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How Industrial Design supports a Customer-Centric Innovation approach in a Technology-Centric business environment.

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This paper provides a case-study whereby a UK University has been working in close partnership with Parker Hannifin Corporation, a Fortune 500 US manufacturing company, to develop new innovation practices. It discusses how Industrial Design has been introduced as an in-house function to one of the company's divisional headquarters, in Gateshead, UK, through a collaborative research partnership over three years. Case material from four projects is presented, which illustrates a progressive, negotiated adoption by the company of the capabilities of Industrial Design as an essential component of a Customer-Centric Innovation approach. It has involved developing the organisation's own confidence about the value and fit of Industrial Design through a series of projects and regular reflection on what is working well, not-so-well and what is raising concerns. The approach described provides an alternative to attempting to develop and implement a pre-formulated 'grand-plan' for Design.

Keywords: customer-centric innovation; industrial design; large organisations; design-led innovation; manufacturing

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Introduction

Over the last decade, there has been steady growth in organisations establishing in-house design capacity instead of relying on out-sourcing through agencies. Many mature businesses have found their capacity to innovate has been stifled by an overreliance on technical innovation and are looking to Design to reshape their approach. This follows the celebrated successes of companies such as Apple and the arguments for Design articulated by IDEO's Tim Brown (Brown, 2009), Roger Martin (The Design of Business, 2009) and others. This new expectation presents a challenge for Design, particularly in large organisations: How can innovation processes be recast, to define and situate in-house Design capability such that it won't be too constrained to be effective? How should the design function relate to existing disciplines, directorates, departments and already established business processes?

This paper provides a case-study whereby a UK University has been working in close partnership with Parker Hannifin Corporation, a Fortune 500 US manufacturing company, to develop new innovation practices. It discusses how Industrial Design has become an essential driver of the organisation's Customer-Centric Innovation approach and illustrates its growing influence within the Corporation.

Forming the partnership for the research

The collaboration between Northumbria University, UK. and Parker Hannifin (PH) developed out of a dialogue between one of PH's Divisional Marketing Managers based in the UK and the University's Design School. He had observed that whilst PH Gateshead saw itself as innovative, it wasn't meeting all of the corporation's targets around the proportion of 'new-to-the-world' products in its portfolio. Although there were a substantial number of projects in development (50+), almost all were improvements, modifications and extensions to existing product families. Through the Divisional Marketing Manager, PH had begun to explore how to build a team to incorporate strategic market-development and product management and perhaps design to address this. The Design School team felt that Industrial Design could be a key actor in that process and as a result, the partnership was formed to explore the value of taking a customer-centric view of innovation in this technology-centric business.

The Company itself recognized that the impetus for many of the original product lines had been provided by emerging technologies of the time. Now, however, it was increasingly difficult to command a premium margin when competitor-product performance was becoming, if not comparable, then 'good enough' in several sections of the market. If there was less opportunity to innovate through a technology push approach, Parker would need to develop their capacity to better understand and interpret their customer's needs as a source of innovation. To do this a collaborative research plan was formed between the business and Northumbria University, to promote knowledge exchange in both strategic marketing and industrial design. A combined academic team from the Design School and the Business School would investigate ways to shape innovation practices at PH by improving the quality of engagement the company had with its customers during the early phase of product development. The collaborative research plan anticipated a series of pilot projects that could be used to define and test the new approaches, leading to an understanding of their efficacy and value in this context. The approach was titled *customer-centric innovation*, as it would focus on developing an understanding of customer needs as a source of insight for innovation.

Customer-centric innovation

The purpose of the collaboration was to develop capacity for the sort of innovation that goes beyond incremental development and is capable of exploring and defining what customers would really value – the sort of innovation that is strategic not tactical. The term *customer-centric innovation* was used in the planning documents to summarise the project goal, because it served as a useful, descriptive term – not because we were following any one academic definition of this strategic type of innovation. There are many different terms in the design literature that capture the approach we were advocating, Verganti's *design-driven innovation* being one of the best known, and which is variously described in the academic Business literature as 'discontinuous' (Veryzer 2005), 'bold' (Cooper 2011) or Value innovation (Kim & Mauborgne, 2008). Here, we are using the term *customer-centric innovation* because it builds from an understanding of customers needs, and uses that understanding to drive innovation. As an important distinction, it should be noted that it is not a process of simply providing what customers request (corroborated by Selden & MacMillan in

their Harvard Business Review article in 2006, and by The UK Design Council in their qualitative study *Leading Business by Design*).

. . . . this approach makes design strongly customer-centred, but not necessarily customer-driven. The difference is that the former is about understanding customer needs and wants they may not even realise they have themselves, while the latter is simply a matter of responding to existing demand. Being customer-centred allows companies to lead and innovate, not just be buffeted by the market. (from Leading Business by Design, 2012)

In practice, we view *customer-centric innovation* as a mode of practice that approaches Verganti's *design-driven innovation* (Verganti 2009) but avoids the semantic risk of suggesting that Designers are in charge. The authors appreciated that a theoretical or overt design-led approach might create resistance. On that basis, the *customer-centric innovation* term was preferred for this multidisciplinary (Marketing, Design, Engineering) setting.

Research approach

The paper considers the degree of acceptance and adoption of Industrial Design across four case-study projects, identifying activity that effected a customer-centric approach and has therefore contributed to the company's capacity for breakthrough (ie beyond incremental) innovation.

In the case described, the work of the academic team has been situated in a live, commercial context, throughout the study. The case-study approach (Yin, 2013) was adopted to examine contemporary phenomena in a real-life setting. The academic team followed an inductive, action-based research approach to understanding the organizational culture (Hatch *et al*, 2008) and the key responsibilities around Innovation and New Product Development. It involved situating an Industrial Designer employed by the University in the business, full-time. This arrangement enabled the authors to report outcomes in relation to what proved to be possible/negotiable in the context of real business demands during a three-year collaboration. Findings are discussed in the context of the compromise and pragmatism necessary to effect organizational change.

The authors of this paper include members of the academic team, the Industrial Designer who was the focus of the collaborative knowledge exchange and key staff in the company from the Marketing and Engineering departments. The authors therefore use their own first-hand experiences as part of the study. The authoring team met three times a year specifically to discuss and reflect on progress towards embedding the customer-centric innovation approach, and to reach agreement on the next necessary phase of activity. This has enabled the case material presented to be cross-referenced to the records of those meetings. Further project evidence is drawn from the personal reflective-practice accounts maintained by the Industrial Designer through the period of the study as part of his own post-graduate research.

Business Context: product and technology-centric manufacturing

When the partnership between the University and Parker Hannifin (Gateshead, UK) was formed, PH presented as a technology-centric business environment. It has a long history of technological innovation, has developed some of the key patented technologies in its sector and has promoted technically oriented staff into several key Senior Management roles. The business's main product lines: industrial filters, are considered best-in-class in terms of performance, needing significantly less energy than competitor-products to push gases through the filter elements, whilst still effectively removing the targeted impurities. It has excellent analytical knowledge in its R&D and Engineering teams to both continuously improve performance characteristics and map and evaluate emerging technologies. On this basis we characterize the company as predominantly technology-centric and already highly-capable in technology-driven innovation.

Marketing: PH already had some marketing provision in the form of Business Development Managers (BDMs) and a Divisional Marketing Manager (DMM), but only the DMM was actively engaged in *strategic* market research and development at the beginning of the partnership. The BDM roles were focused principally on sales-management.

Industrial Design: PH already used design but on a peripatetic basis where projects were judged to need some design input. This tended to be

triggered by concerns about user-interface elements emerging at the prototyping stage, rather than being driven by the opportunity to understand customers. Since the acquisition by Parker in 2006, this had typically been commissioned as product design consultancy, once the product's overall form, function and configuration had been determined. The design input to-date had therefore been limited to product aesthetics.

When Parker took control in 2006, corporate brand guidelines were introduced, which included a guideline product language for the Parker Group, with illustrated examples and key corporate colours defined. However, in 2013 at the start of the current collaboration, this had not yet been implemented on any products at PH Gateshead.

PH's existing product range and innovation drivers

The majority of the company's product portfolio was conceived from a technology-driven perspective where opportunities for innovation emerged principally through excellence in technology development and R&D. This approach had been highly successful, positioning the organization (then trading as 'domnick hunter' (dh)) as a market-leading, premium brand in Filtration. By introducing original equipment from this market-leading position, PH had established a high-volume after-market business, selling replacement filter elements to its installed base. However, over the last few years, some of the key Patents had reached the end of their term and the industrial filtration sector had become commoditized as competitors launched generic refill-elements.

Looking at the pattern of innovation through this period of relative strength in the market, the emphasis on tailored product versions to suit particular customer requests had grown, but the focus on strategic (or bold) innovation had waned. This follows the general trend across the sector of mature manufacturing in between 2000 and 2010, which saw incremental development work almost double and new-to-the-world product innovation almost halve compared to the previous decade (Cooper, 2011). Some enquiries through the PH sales team implied new market areas, so were managed within the firm from a more multifunctional perspective. They were typically led by the BDMs, using for example some competitor analysis and voice-of-the-customer (Griffin & Hauser, 1993) before briefing the technical team on those findings. This product-development mix illustrates that the company was already able to bring new technology-elements to

market to improve performance; *technology-driven*, and was also able to respond to opportunities identified by customers; *customer-driven*. What was not in place, was a *customer-centric* approach for proactive exploration of customers' needs, i.e. not simply listening to the customer, but working closely with them through a proactive approach to problem definition, and understanding both their explicit and their as-yet-unexpressed needs. This lack of proactive market-development and innovation strategy had left the organization poorly prepared for new competition and market commoditization.

At the beginning of the collaborative project with the University, when the Gateshead site assessed its development portfolio, it found that although the overall volume of product development was high, it wasn't meeting PH Group's metrics for the proportion of 'new-to-the-world' products in-progress.

Key projects delivered through the collaborative partnership

Through almost three years of collaboration, the partnership between PH (Gateshead) and Northumbria University shared research, guidance, expertise and staff resources to establish and embed a customer-centric innovation approach in the company through both Strategic-Marketing and Industrial Design. In this part of the case-study we describe four projects that were significant from the Industrial Design perspective. Together they illustrate a progressive, negotiated adoption by the company of the capabilities of Industrial Design as an essential component of a Customer-Centric Innovation approach.

Project 1

In 2013, just prior to recruiting the in-house Industrial Designer to the main collaboration, PH worked with Northumbria University Design School to address a strategic product-branding question. A detailed, European study of brand equity survey in the Gas Treatment category found that awareness of the "Parker Hannifin" (PH) brand was stronger than the "Parker - domnick hunter" (Pdh) sub-brand (79% of customers were aware of the PH brand, as compared to 56% for Pdh). A key product in this range; 'NitroSource' was scheduled for relaunch with significantly improved

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technical performance. It was decided that it should be the first product from the Gateshead site to adopt the PH global product language and colour palette outlined in PH brand guidelines. The design academics at Northumbria University worked closely with the company to realise this project. Industrial Design focused on interpreting the brand guidelines and redefining the user-facing components – ie protective covers, enclosures, doors, connection point graphics etc – to embody them. The core pressure vessels, valves and manifolds (internal functional performance components) retained the size and general arrangement of the previous models sold as Pdh, although, performance testing, demonstrated that a step-change had been achieved in the gas-treatment performance.



Figure 1. Nitrosorce-Maxigas displayed in the company foyer in its full Parker Hannifin product language and livery – the first product produced at the Gateshead site to adopt the Group's brand guidelines.

The revised product had a 'soft-launch' to internal teams within the PH group and quickly became influential. Supporting product launch materials were produced through an external communication agency, using digital animation, giving the product high visibility online within the PH group. The first-off prototype unit and its supporting video material attracted positive feedback in meetings of the General Managers representing manufacturing sites around the world. The product was relaunched in 2014, and the combination of improved performance specification with the full Parker look-and-feel has generated a 27% increase in sales over the previous year.

The effect of this product prototype build and then its launch has triggered systematic adoption of the PH brand language. Internally, there had been resistance to moving away from the original Pdh colour palette of red or purple, based on the belief that they were brand elements that signified Pdh's provenance and therefore carried caché with customers. Hence that palette still dominated, eight years after acquisition by Parker. The Nitrosource product built familiarity with the PH gold and grey colour palette amongst the internal teams and attracted positive feedback from the first customers, breaking down resistance to change through its sheer presence. Within a few months of the Nitrosource prototype build, the design team were asked to look at a wider brand implementation project. It was to consider the possibility of switching to the PH colour palette across the full suite of filtration and gas generation products from three European divisions of PH, each with their own pre-acquisition colours palettes. Several alternatives were considered, some with retained elements of the pre-acquisition colours, and others without. The before and after visuals produced to illustrate this process proved so persuasive to the case for reconciling to a single palette that just one year later, the three divisions showed the whole range at Hannover Messe (Europe's biggest industrial trade show) in the adopted PH colours.



Figure 2. Images of the range shown at Hannover, including the Nitrosource, displaying the full ParkerHannifin colour palette - April 2015

Project 1, reflection on outcomes:

Although the Nitrosource project was not undertaken through a fully customer-centric approach, it introduced ID to the company as a complementary activity to current Marketing and Engineering functions. The

project had a strategic role as the first piece of Industrial Design work to implement the new PH look-and-feel in accordance with the Group's brand guidelines. This led directly to the follow-on work to define a consolidated look-and-feel for the family of filtration products across three EU sites. In doing so it began the process of interpreting those guidelines to suit the PH Gateshead product ranges, for example it established a general design principle to consistently use black for leg, foot or floor-fixing elements of the product. Parker staff saw the product realised as a prototype and heard the positive customer feedback, paving the way for the introduction of the in-house Industrial Designer some months later. This was reinforced later by the subsequent product sales increases. The project also provided the evidence needed for the team in Gateshead to seek endorsement from the US-based VP Innovation for the collaborative research plan that would introduce Industrial Design in-house.

Project 2

In preparation for the introduction of the Industrial Design function to the business, the collaborative project team identified a potential project area to investigate. It was situated in the Food and Beverage sector and the strategic marketing team was considering whether a PH technology for removing impurities from Carbon Dioxide gas (CO₂) might have potential in new markets. One promising application seemed to be at the point-of-dispense for carbonated drinks, where preliminary investigation had shown that two-of the three ingredients were certified pure at the point of dispense – syrup and water, but the third, CO₂ was not. This became the brief for a combined design and marketing investigation of the potential for a new product. Filtering CO₂ supply at its source of production and before being transported and bottled was the norm. There is the possibility of contaminants being introduced during transportation and bottling and from within the gas lines from bottles to the point of use, but this was unlikely to be an issue in industrial applications. However, even these lower risks could be important in CO₂ for human consumption, so there was a potential problem to address. Together, Marketing and Design visualized the problem in diagrammatic form and began to define a set of assumptions that they would like to test with customers/end-users to inform the development of the overall value proposition (Jones *et al* 2016). Through this process PH were able to qualify that the problem was acknowledged by their customers as a real issue worth addressing.

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Exploring *how* the problem might be solved began with a brainstorming session (Fig. 3. below), based on a series of carefully formulated questions, involving designers, engineers and project managers. This was staged off-site within a design-studio at the University, as part of breaking the participants away from their traditional modes of thinking. The questions reframed the problem at a more abstract level, and used examples of how comparable problems were solved in other very different industries to help the participants generate the widest range of ideas. For example, replacement print-cartridges were identified as an example of an analogous product in a different market, and both the business model and the digital-authentication technologies of those devices were used to draw an analogy to the filtration opportunity. This triggered several new areas of thinking around smart-filters ranging from those that would know when they need changing and could tell maintenance teams, to those that could even let customers know how pure their drink is today - building trust and therefore equity for the drinks brand as a new value stream.



Figure 3. Structured brainstorming session at the University

This work demonstrated the capacity to radically innovate the value and meaning of a product to its customer, when design approaches are applied, not just to an already constrained technology-package (as in Project 1 above), but to a new problem-space.

Following the brainstorm, ideas on user-interactions, ergonomics, pricing models, product qualities and features, aesthetics and technical configurations were all used to stimulate design development. Sketches and appearance-prototypes were produced and taken to potential customers to stimulate a discussion about what was valuable and not-so-valuable. The level of engagement achieved with these few lead-customers, enabled them to share relevant ideas and contribute to improving integration with their existing equipment and maintenance routines.

With a clearer understanding of the product opportunity now defined, the business potential was considered in greater detail and potential major customers identified and approached. This has led to a collaborative (and transparent) partnership with a key customer to undertake product efficacy trials with a view to adopting the technology as part of the way they operate. The visual problem-statement produced at the outset of the project has also generated a discussion in the wider drinks-industry, which has led the industry representative body ISBT to change its members' guidelines, to recommend point-of-dispense filtration. PH are now in primary-position to respond to that new market opportunity. The project is ongoing.

Project 2, reflection on outcomes:

The approach enabled the Industrial Designer and others to fully engage with anticipated customers, showing sketches, images and prototypes to test assumptions about the likely product requirements. This resulted in the identification of a key insight when the customer handled the appearance prototype, which concerned fixing the new product to existing installed equipment. This had not been expressed in any discussions up to that point. New user-interactions were also proposed, which could make maintenance a safe process for a different range of users and would provide a distinctive and potentially more memorable interaction. The company was able to understand the value of such a new product to its potential customers before the technical requirements (in terms of filtration performance) had been fully defined. This allowed the costs of researching and optimizing technical performance to be rescheduled to a time after market-desirability had been established. This also presented new challenges because once the market-desirability was established the careful process of realizing that product as a reliable and effective device worthy of the PH brand is subject to greater time-pressure, because of the need to reach market as quickly as

is reasonably possible. In the event, additional Engineering resource was bought in, which is indicative of the importance the company placed on this new opportunity.

This project attracted the attention of PH's head office and reinforced the view that the Gateshead site had dynamic leadership and was capable of investigative, market-defining, strategic innovation.

Project 3

With the introduction of the Industrial Design capability and parallel development of a strategic marketing team, there was an opportunity to consider the nature of the office space at the Gateshead site. After Project 2, the new focus on innovation at the Gateshead site had been noted by senior VPs in the international business. Proposals were made by the Divisional Marketing Manager to better equip the office spaces for team-based projects to continue to promote this approach. This was not a project that had been anticipated in the collaborative project plan at the outset of the partnership. It had had been made possible by the growing acceptance that innovation was core to the future of the business in Gateshead and that the site had positioned itself, in the eyes of the Group, as effective at adopting key corporate priorities. A project was initiated to rethink the office space as part of promoting better integration between the growing Strategic Marketing team, new innovation and design capacity and the more established Engineering team. The three functions shared a long open-plan office but thoroughfares to the shop-floor and a general lack of break-out space limited the amount of incidental communication and collaboration that open-plan might have offered.

Space was allocated within this open-plan office, and some visualization work commissioned externally, before a budget was secured to build a new collaboration and creative-thinking space. Once instated, this became something of a flagship space, with key visitors, customers and executives being shown the space as a physical representation of a new, progressive approach.



Figure 4. The Ideas Lab space create for multidisciplinary collaboration.

The senior management team in Gateshead are clearly proud of the space and the narrative around innovation, which it affords them.

It was created as a non-bookable space, which can be used to collect a multidisciplinary team around an issue in a quick and informal way as well as hosting structured project workshops and brainstorming. Wall graphics promote design processes and the colours in the new space reflect the Parker brand guidelines. It has been called Ideas-Lab, following the name of PH's online 'suggestion-box' process for surfacing and prioritizing new product ideas from staff and stakeholders.

Project 3, reflection on outcomes:

Having been commissioned by the Strategic Marketing group and being situated near to them, many of the early activities in the space were led by Marketing, which created a perception that the space was actually theirs and not truly shared-use. However, over a period of around 12-months, this has been broken down and the space has become well-used for team-based discussion and problem-solving sessions with all disciplines involved. The

new space is designed to support such multidisciplinary approaches in the early phase of exploring new market areas. Because many of the approaches and facilitation process skills used in innovation teams mirror design-thinking and visual problem-solving, the promotion of the space has simultaneously helped to affirm the role of Industrial Design in the business going forwards. Hence the physical space symbolises the strategic commitment the company has made to embedding the new design discipline, to the full adoption of new Parker branding, and to putting a new emphasis on innovation as a multidisciplinary activity.

Perhaps most important of all, it shows that developing a culture of innovation is not a fad or a temporary obsession. Physical changes to the space are not easy to reverse and have clearly had some investment, so the Ideas-lab demonstrated an absolute commitment to nurturing an innovation-focused organizational culture (Hatch *et al*, 2008). It is realized to a high specification and manifests the change towards brand coherence and corporate self-belief.

It has already had a striking impact in the wider corporation, creating the expectation that every Parker site might develop such a space. If this becomes organizational policy, the introduction of these physical innovation spaces would provide a channel for the value of design-thinking (through the Industrial Design function) to propagate across the group as confidence in its effectiveness at the PH Gateshead site is established. With this in mind, some of the design-thinking methods which have worked well to date, are currently being assembled into a workshop-facilitator's toolkit for use with multidisciplinary teams.

Project 4

From the outset of the collaboration, emphasis had been put on ensuring that the Customer Centric Innovation approaches, developed and rehearsed through successive projects, be codified and embedded in the organization. Having worked on a range of projects, including the key projects 1 and 2 reported here, the academic team and the Industrial Designer worked on defining the key actions for Industrial Design. PH had a comprehensive but fairly new set of processes for innovation when this study began. Staff were trained in the processes when they joined the company, however, as in any organization, there had been a tendency to fit the procedures to the available expertise and resources, so adoption was

still in-progress. PH corporate innovation processes encompassed a market analysis tool: ‘Winmap’, a stage and gate New Product Development tool: ‘Winovation’, and a price positioning tool: ‘Winvalue’. The academic team and the Industrial Designer used the knowledge and experience gained from the projects undertaken during the preceding stages of the partnership to develop, document and map Industrial Design focused tasks to the existing processes. This was a collaborative activity with colleagues from Engineering and Marketing who were undertaking a similar mapping process for their own function. The Winovation process can be considered as an over-arching framework – with various levels of activity and measures to allow projects to progress to the next stage, or sub-stage. One of the most valuable parts of this process was that this stimulated discussion and negotiation between Marketing, Engineering, Project Management and Industrial Design – in order to agree and assign task activity, ownership and contribution to each function. This project is still in progress at the time of writing and is due to complete by July 2016.

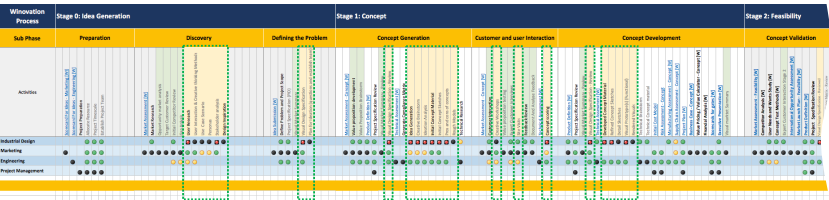


Figure 5. Winovation management spreadsheet – this excerpt shows approximately the first half of the whole process map, with activities involving Industrial Design (ID) highlighted (the vertical columns framed with the dotted-lines). This overview illustrates the significant level of responsibility that Industrial Design now takes in the early stages of the overall innovation process.

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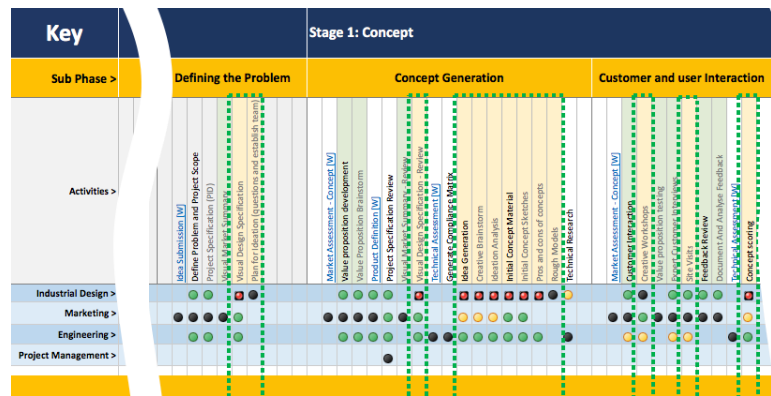


Figure 6. Winovation management spreadsheet – this more detailed excerpt shows the specific customer-centric tasks identified for the ID function. The icons below each activity show how ownership of each task has been negotiated across the multidisciplinary project teams with leadership responsibility denoted in either black (or red-over black where the task is owned by ID).

Project 4, reflection on outcomes:

Although this final phase of the partnership is still ongoing, it demonstrates that the Industrial Design function is now being negotiated into a fully defined relationship with the other disciplines in the business. This includes taking an ownership role in some of the early phases of the innovation process. A role for Design which would not have been possible at the time of Project 1. The importance of the facilitation role in multidisciplinary teams has also now been recognised and captured in organisational policy as well as celebrated through the graphical process maps in the new 'Ideas Lab' innovation space.

This process of close, inter-disciplinary negotiation has been open and positive but has still raised issues and challenges. For example, it revealed a concern that innovation was being discussed as a design-based activity, and that this fails to recognize the innovation contribution made by the Engineering team. Similarly, there was a willingness and appetite amongst the Engineering team to be involved in the customer-research elements of the innovation process, having found their own contact with customers had gradually diminished in recent years.

Conclusions

This case and the individual projects within, have demonstrated a staged approach to establishing a customer-centric innovation capability in a mature, technology-centric organisation.

It has involved developing the organisation's own confidence about the value and fit of Industrial Design through a series of projects and regular reflection on what is working well, not-so-well and what is raising concerns along the way. Rather than decry Design's lack of influence at board level it accepts a reflective process of building trust around the discipline through practice and its demonstrable achievements.

It shows a logical progression from demonstration of operational and tactical Design input in terms of product aesthetics and interpretation of corporate brand language in *Project 1*. Through demonstrating the capacity to investigate and define new markets through a customer-centric approach to innovation in *Project 2*. And in *Projects 3 and 4* it demonstrates Design's capacity to influence culture and policy, initially within PH Gateshead but with plans to extend that across the group in the future. As such it provides an alternative approach to attempting to develop and implement a pre-formulated 'grand-plan' for Design.

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